REMARKS/ARGUMENTS

Applicants submit this Amendment under 37 CFR § 1.116 in response to the final rejection of the Office Action dated March 17, 2009. Entry of this Amendment is believed proper on the basis that all pending claims are placed in condition for allowance.

Independent Claim 1 and dependent Claims 2, 8-21, and 23-29 were rejected under 35 U.S.C. 103(a) as being unpatentable over PCT Document No. WO 01/78219 to Sadarangani, et al. ("*Sadarangani*") in view of U.S. Pat. App. Pub. No. 2002/0180295 to Kaneda, et al. ("*Kaneda*"). Dependent Claims 3, 4, 6, and 7 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Sadarangani* and *Kaneda*, in further view of U.S. Pat. No. 4,308,479 to Richter ("*Richter*"). Dependent Claim 5 was rejected under 35 U.S.C. § 103(a) as being unpatentable over *Sadarangani*, *Kaneda*, and *Richter*, in further view of U.S. Pat. No. 6,211,593 to Nashiki ("*Nashiki*").

With respect to Claim 1, the Office Action contends that *Sadarangani*, in further view of *Kaneda*, teaches "an intermediate member comprising at least one secondary magnet which has a north pole and a south pole and a magnetic direction extending from the south pole to the north pole and essentially across the magnetic direction of the primary magnet." (See Office Action, page 3). While the Office Action concedes that *Sadarangani* fails to disclose a secondary magnet, it contends that the present invention's configuration for the secondary magnets of the intermediate member is rendered obvious by *Kaneda*. Furthermore, the Office Action contends that a person of ordinary skill would be able to apply the configuration disclosed in *Kaneda* to *Sadarangani* for the purpose of "reducing the magnetic flux leakage between adjacent permanent magnets." (See Office Action, page 3). However, Applicants respectfully disagree both with the contention that it is obvious to modify *Sadarangani* with the teachings of *Kaneda* and with the contention that such a modification could achieve the present invention.

First, a person of ordinary skill would not find it obvious to modify the linear machine *Sadarangani* to include the secondary magnets of the rotary machine of *Kaneda*. Instead, a person of ordinary skill in the art would consider modifying the linear machine of *Sadarangani* to include secondary magnets a step backwards, particularly because the inclusion of secondary magnets has the following implications:

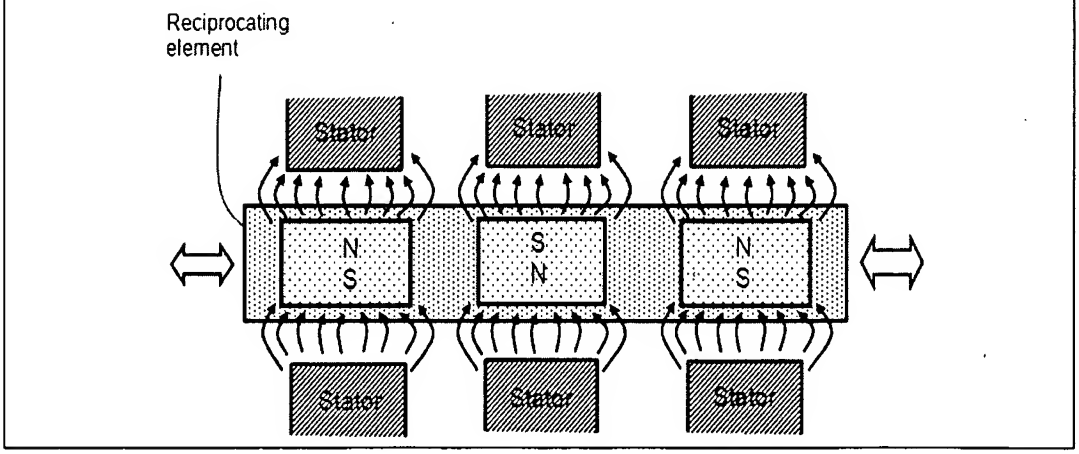
(a) requiring more components parts to be assembled together on the reciprocating element, thereby rendering the machine more expensive to construct;

(b) increasing the weight of the reciprocating element; and

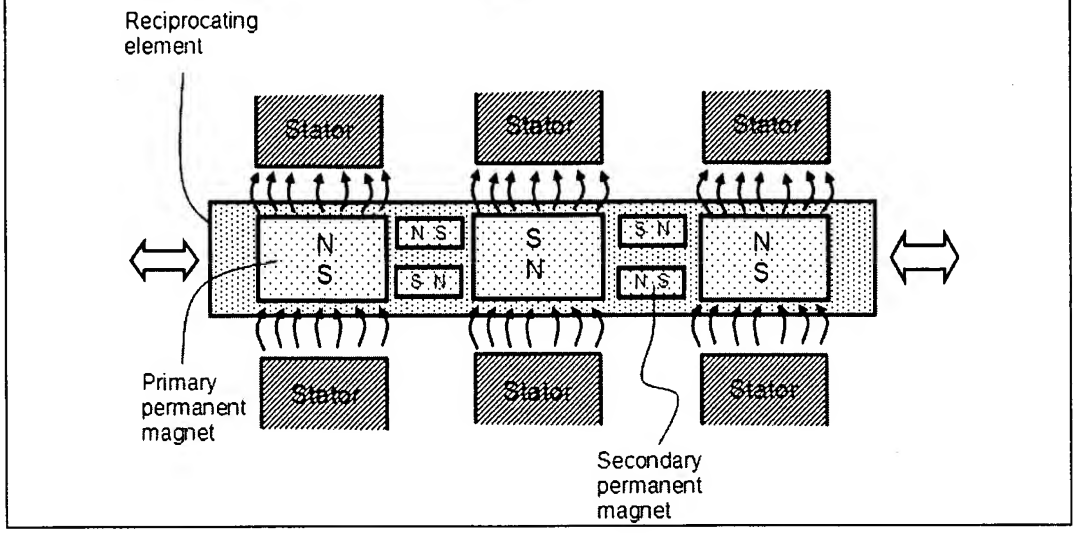
(c) increasing the spacing between the primary magnets, resulting in a less rapid change of coupled flux as the reciprocating member moves and rendering the electromagnetic induction less efficient.

Contrary to the reasoning illustrated in (a) through (c), however, the inefficiencies introduced by the inclusion of the secondary magnets in the present invention are more than compensated for by the benefits derived. As claimed in the present invention, the secondary magnets increase machine performance by concentrating the magnetic field of the primary magnets. Accordingly, the present invention achieves a net performance advantage <u>despite</u> the additional mass of the secondary magnets on the reciprocating component. This advantageous result is not made obvious, or even hinted at, by *Sadarangani* and *Kaneda*. An embodiment of the present invention, as illustrated below in relation to *Sadarangani* makes the advantages of the invention more visible:

Linear reciprocating machine as described in Sadarangani et al. (WO 01/78219)



Linear reciprocating machine according to an embodiment of the present invention



Furthermore, even if a motivation to combine *Sadarangani* and *Kaneda* were to exist, Applicants disagree with the Office Action's contention that "a person of ordinary skill would *be able* to apply [the] technique [of *Kaneda*] in the invention of *Sadarangani* for the purpose of reducing the magnetic flux leakage between adjacent permanent magnets." (See Office Action, page 3, emphasis added). Rather, applying the technique of *Kaneda* in the invention of *Sadarangani* would not achieve the invention recited in Claim 1.

Kaneda does disclose a rotor with a peripheral arrangement of primary magnets having gradually changing magnetic field directions. However, there is no squeezing of the primary magnetic field by a secondary magnetic field to concentrate flux. Instead, *Kaneda* discloses a *gradual* change in flux direction primarily for avoiding cogging effects. That is, the series of gradually changing magnetic field directions in *Kaneda* reduces cogging torque but does not concentrate the flux of the primary magnets. The configuration in *Kaneda* does not effectuate flux squeezing and, accordingly, does not avoid flux fringing. Therefore, *Kaneda* does not teach "permanent-magnet members [adjacent to] secondary magnets [that] are operable to mutually repel for essentially avoiding flux fringing in respect of the stator" as required by Claim 1.

Additionally, Applicants also disagree with the Office Action's equation of the magnets disclosed in *Kaneda* to the secondary magnets of Claim 1. According to the Office Action, a person of ordinary skill would have been able to modify the rotary machine disclosed in *Kaneda*

based on the configuration demonstrated in U.S. Patent No. 5,723,917 to Chitayat ("*Chitayat*"), for the purpose of reducing the magnetic flux leakage between the adjacent permanent magnets. (See Office Action, page 10). However, Applicants disagree with the Office Action's assertion that modifying the invention disclosed in *Kaneda* based on the teachings of *Chitayat* would achieve the invention claimed in Claim 1. Moreover, Applicants have herein amended Claim 1, as recited below, to further clarify the features distinguishing the present invention from *Kaneda* and *Chitayat*.

No combination of the prior art teaches "magnetic fields of adjacent permanent-magnet members and their secondary magnets [that] are operable to *mutually repel* for essentially *avoiding flux fringing* in respect of the stator" as recited by amended Claim 1. (Emphasis added). The configuration disclosed in *Kaneda* does not result in the elimination of flux fringing achieved by Claim 1 of the present invention. Rather, *Kaneda* teaches achieving greater efficiency and smaller size by employing the conventional method of implementing small *air gaps* between the rotor and the stator to reduce fringing. The configuration of magnets creating a non-radial distribution of magnetic fields taught by *Kaneda*, on the other hand, does not have the effect of reducing flux fringing but rather of reducing cogging torque, as clearly elucidated in the following paragraphs:

- paragraph [0011]: "decrease cogging torque"
- paragraph [0050]: "adjusting skew angle to reduce cogging torque"
- paragraph [0055]: "approximating to a sinusoidal distribution as number of poles is increased"
- paragraph [0067]: "cogging torque lowered in respect of radial magnetization."

More specifically, *Kaneda* teaches progressively orienting the magnetic fields of a series of primary magnets around a rotor to reduce cogging torque.

Chitayat also fails to teach positioning secondary magnets in such a way that they mutually repel adjacent primary magnets to avoid flux fringing, as required by Claim 1 as amended. Instead, *Chitayat* teaches a configuration that "*focuses* the *magnetic flux* toward the armature assembly . . . while minimizing *magnetic flux* entering the backplate." (*Chitayat*, column 3: lines 26-29) (emphasis added). Unlike Claim 1 of the present invention, *Chitayat* does not teach "avoiding *flux fringing* in respect of the stator." (Emphasis added).

In contrast to *Kaneda* and *Chitayat*, the present invention comprises one or more secondary magnets, whose magnetic pole axes are orthogonal to the magnetic pole axes of the primary magnets, such that the primary magnets mutually repel the adjacent secondary magnets. The configuration recited in Claim 1 has the effect of squeezing the fringe magnetic fields of the primary magnets into a transverse direction relative to a direction of reciprocation, toward the magnetic flux conductors of the stator, thereby eliminating fringing magnetic flux, and ultimately improving the efficiency of the reciprocating machine.

Applicants have made significant contributions to the art which are neither taught nor suggested by the cited prior art, either alone or in combination. Inasmuch as at least the above-discussed feature of Claim 1 is clearly not taught or suggested by the cited references, Applicants respectfully submit that Claim 1 as amended patentably defines over the art of record. Since the patentability of independent Claim 1 has been argued as set forth above, Applicants will not take this opportunity to argue the merits of the rejection with regard to dependent Claims 2, 8-21, and 23-29. However, Applicants do not concede that the dependent claims are not independently patentable and reserve the right to argue the patentability of the dependent claims at a later date if necessary.

CONCLUSION

In view of the remarks presented above, Applicants respectfully submit that all now pending claims are allowable and such favorable action is respectfully requested. Should the Examiner have any questions, comments or proposed claim amendments, he is encouraged to contact the undersigned so that allowance of this application can be expedited.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,

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